Math 120A
August 22, 2019

Question 1 The functions $f_k : [0, 1] \to \mathbb{R}$ given by $f_k(x) = x^k$

A. are all continous.

B. converge pointwise to a discontinuous function.

C. converge uniformly to a discontinous function.

*D. **A** and **B**.

E. all of the above; if they converge uniformly, they also converge pointwise.

Question 2 Let γ be the curve $|z| = 2$ with positive (counterclockwise) orientation. Then the integral $\int_\gamma \frac{z^n}{z-3}\, dz$

*A. is equal to 0 by Cauchy's theorem.

B. is equal to 3^n by the Cauchy integral theorem.

C. is equal to $2\pi i\, 3^n$ by the Cauchy integral theorem.

D. is undefined because $\frac{z^n}{z-3}$ is undefined at $z = 3$.

E. none of the above.

Question 3 Let γ be the curve $|z| = 2$ with positive (counterclockwise) orientation. Then the integral $\displaystyle\int_\gamma \frac{z^n}{z-1}\,dz$

A. is equal to 0 by Cauchy's theorem.

B. is equal to 1 by the Cauchy integral theorem.

*C. is equal to $2\pi i$ by the Cauchy integral theorem.

D. is undefined because $\dfrac{z^n}{z-1}$ is undefined at $z = 1$.

E. none of the above.

Question 4 Let γ be the curve $|z| = 2$ with positive (counterclockwise) orientation. Then the integral $\displaystyle\int_\gamma \frac{z^n}{z+2}\,dz$

A. is equal to 0 by Cauchy's theorem.

B. is equal to $(-2)^n$ by the Cauchy integral theorem.

C. is equal to $2\pi i\,(-2)^2$ by the Cauchy integral theorem.

*D. is undefined because $\dfrac{z^n}{z+2}$ is undefined at $z = -2$.

E. none of the above.

Question 5 A set $D \subset \mathbb{C}$ is a *domain* if

A. for every $z \in D$ there is $\epsilon > 0$ so that $\{w \in \mathbb{C} \mid |w - z| < \epsilon\} \subset D$.

B. any two points in D can be connected by a continuous path consisting of a finite number of line segments.

C. for every pair of points $z_1, z_2 \in D$, the line segment joining them is contained in D.

*D. **A** and **B**.

E. all of the above.